

Amendments to the Drawings:

Enclosed with this Response is a drawing sheet that includes changes to Fig. 1. This sheet, which includes only Fig. 1, replaces the original sheet including Fig. 1.

Attachment: Replacement Sheet 1/12

REMARKS

Claims 1-35 were pending in the Application prior to the outstanding Office Action. Claims 9-16, 22-23, 27 and 33-35 have been withdrawn from this application. Claims 19 and 28 were rejected under 35 U.S.C. §112. Claims 1-2, 6, 24 and 29-32 were rejected under 35 U.S.C. §102. Claims 3,17-21, 25-26, 28 and 30-32 were rejected under 35 U.S.C. §103. Claims 7-8 were objected to.

I. RESPONSE TO REJECTIONS UNDER 35 U.S.C. §112

In paragraph 4 of the Office Action, the Examiner rejected claims 19 and 28 under 35 U.S.C. 112, first paragraph. Applicants have amended claim 19 to clarify that each contact pad may include a sensor. Therefore, Applicants respectfully assert that claim 19 satisfies the requirements as set forth in 35 U.S.C. §112, first paragraph. Applicants have cancelled claim 28.

In paragraph 6 of the Office Action, the Examiner rejected claims 28 and 31 under 35 U.S.C. 112, second paragraph. Applicants have cancelled claims 28 and 31.

II. RESPONSE TO REJECTIONS UNDER 35 U.S.C. §102

In paragraphs 7-11 of the Office Action, the examiner rejected claims 1-2 and 6 under 35 U.S.C. §102 as being anticipated by:

A. U.S. Patent No. 6,623,235 Issued to Yokota et al (“Yokota”)

In paragraph 8, the Examiner rejected claims 1, 2 and 6 under 35 U.S.C.102(e) as being anticipated by *Yokota*

1. Independent Claim 1 is Patentable Over *Yokoto*

Claim 1, among other things, recites:

“a first gripper arm and a second gripper arm each operatively mounted to said workpiece blade, said first and second gripper arms each including a contact pad;

.....

means for dynamically adjusting the force exerted by said first and second gripper arms on the workpiece after said first and second gripper arms are located in said workpiece-engaging position.”

The edge gripping device 10 disclosed in *Yokota* does not teach “means for dynamically adjusting the force exerted by said first and second gripper arms on the workpiece after said first and second gripper arms are located in said workpiece-engaging position.” *Yokota* teaches an end effector that includes a blade 32 and a pair of arms 36 - both moved by an actuator 100. *Yokota* discloses that “the gripping speed and force at impact may be suitably controlled to reduce impact forces on the substrate.” [emphasis added] *Yokota*, 6:27-28. *Yokota* does not teach adjusting the force exerted on the workpiece after the pair of arms 36 and blade 32 grip the edge of a workpiece. Therefore, Applicants respectfully suggest that the end effector recited in claim 1 is not anticipated by *Yokota*.

2. Dependent Claims 2 and 6 are Patentable Over *Yokota*

Dependent claim 6 depends directly or indirectly from independent claim 1. This dependent claim includes all of the limitations of the independent claim from which it depends. Applicants respectfully assert that dependent claim 6 is allowable for at least the reasons set forth above concerning independent claim 1. Applicants have cancelled claim 2.

B. U.S. Patent No. 5,702,228 Issued to Tamai et al (“*Tamai*”)

In paragraph 9 of the Office Action, the Examiner rejected claims 1, 2, 6 and 29-32 under 35 U.S.C. 102(b) in view of *Tamai*. Applicants have cancelled claims 2 and 29-32.

1. Independent Claim 1 is Patentable Over *Tamai*

Claim 1, among other things, recites:

“a first gripper arm and a second gripper arm each operatively mounted to said workpiece blade, said first and second gripper arms each including a contact pad;

.....

means for dynamically adjusting the force exerted by said first and second gripper arms on the workpiece after said first and second gripper arms are located in said workpiece-engaging position.”

The robotic arm disclosed in *Tamai* does not teach “means for dynamically adjusting the force exerted by said first and second gripper arms on the workpiece after said first and second

gripper arms are located in said workpiece-engaging position.” *Tamai* discloses an end effector having a pair of arms - auxiliary members 152A and 152B - that are rotated by a cam mechanism. The extending and retracting motions of the robotic arm directly control the operation of the cam mechanism. The force exerted by the gripper arms 152A and 152B cannot be adjusted while the robotic arm is fully extended. In other words, *Tamai* does not teach adjusting the force exerted on the workpiece after the gripper arms 152A and 152B are gripping the workpiece. Therefore, Applicants respectfully suggest that the end effector recited in claim 1 is not anticipated by *Tamai*.

2. Dependent Claims 2 and 6 are Patentable Over *Tamai*

Dependent claim 6 depends directly or indirectly from independent claim 1. This dependent claim includes all of the limitations of the independent claim from which it depends. Applicants respectfully assert that dependent claim 6 is allowable for at least the reasons set forth above concerning independent claim 1. Applicants have cancelled claim 2.

C. U.S. Patent No. 5,022,695 Issued to Ayers (“*Ayers*”)

In paragraph 10 of the Office Action, the Examiner rejected claims 24 and 29 under 35 U.S.C. 102(b) in view of *Ayers*. Applicants have cancelled claims 24 and 29.

D. U.S. Patent No. 4,715,637 Issued to Hosada et al (“*Hosada*”)

In paragraph 11 of the Office Action, the Examiner rejected claims 1-2 under 35 U.S.C. 102(b) in view of *Hosoda*.

1. Independent Claim 1 is Patentable Over *Hosada*

Claim 1, among other things, recites:

“a first gripper arm and a second gripper arm each operatively mounted to said workpiece blade, said first and second gripper arms each including a contact pad;

.....

means for dynamically adjusting the force exerted by said first and second gripper arms on the workpiece after said first and second gripper arms are located in said workpiece-engaging position.”

The gripping device disclosed in *Hosoda* does not teach “means for dynamically adjusting the force exerted by said first and second gripper arms on the workpiece after said first and second gripper arms are located in said workpiece-engaging position.” *Hosoda* teaches heating and cooling a shape alloy member 196 to move the end effector arms 4 and 5 between open and closed positions. *Hosoda* does not teach adjusting the force exerted on the wafer after the arms 4 and 5 grip the wafer. Therefore, Applicants respectfully suggest that the end effector recited in claim 1 is not anticipated by *Hosoda*.

2. Dependent Claim 2 is Patentable Over *Hosoda*

Dependent claim 2 depends directly or indirectly from independent claim 1. This dependent claim includes all of the limitations of the independent claim from which it depends. Applicants respectfully assert that dependent claim 2 is allowable for at least the reasons set forth above concerning independent claim 1.

III. RESPONSE TO REJECTIONS UNDER 35 U.S.C. §103

In paragraphs 12-15 of the Office Action, the examiner rejected claims 3-5 and 17-21 under 35 U.S.C. §103 under several combinations of the following six patents:

- U.S. Patent No. 4,715,637 issued to Hosada et al (“*Hosada*”);
- U.S. Patent No. 5,022,695 issued to Ayers (“*Ayers*”);
- U.S. Patent No. 5,702,228 issued to Tamai et al (“*Tamai*”);
- U.S. Patent No. 6,256,555 issued to Bacchi et al. (“*Bacchi*”);
- U.S. Patent No. 6,623,235 issued to Yokota et al (“*Yokota*”); and
- U.S. Patent No. 5,988,971 issued to Fossey et al. (“*Fossey*”).

A. *Hosada* And *Yokota*, In View Of *Ayers*

In paragraph 13 of the Office Action, the Examiner rejected claims 3, 17, 18, 20, 21, 25, 26 and 30-32 under 35 U.S.C. 103(a) in view of *Hosada* And *Yokota*, In View Of *Ayers*. Applicants have cancelled claims 25-26 and 30-32.

1. Dependent Claim 3 is Patentable Over *Hosoda* and *Yokota*, in view of *Ayers*

Dependent claim 3 depends directly on claim 1. Claim 1, among other things, recites an end effector having:

“a first gripper arm and a second gripper arm each operatively mounted to said workpiece blade, said first and second gripper arms each including a contact pad;

.....

means for dynamically adjusting the force exerted by said first and second gripper arms on the workpiece after said first and second gripper arms are located in said workpiece-engaging position.”

The gripping device disclosed in *Hosoda* does not teach or suggest “means for dynamically adjusting the force exerted by said first and second gripper arms on the workpiece after said first and second gripper arms are located in said workpiece-engaging position.” *Hosoda* teaches gripping the wafer W with the end effector arms 4 and 5. After the arms 4 and 5 initially grip the wafer W, fixing members 190 and 191 inflate to further hold the wafer W in place. *Hosoda* does not teach or suggest adjusting the force exerted by the arms 4 and 5 on the wafer after the arms 4 and 5 initially grip the wafer. Therefore, Applicants respectfully suggest that the end effector recited in claim 1 is not obvious over *Hosoda*.

Yokota does not teach or suggest the elements missing in *Hosoda*. As discussed above, *Yokota* discloses that “the gripping speed and force at impact may be suitably controlled to reduce impact forces on the substrate.” [emphasis added] *Yokota*, 6:27-28. *Yokota* does not teach or suggest adjusting the force exerted by the arms 36 and the blade 32 on the workpiece after the arms 36 and blade 32 grip the edge of the workpiece. Therefore, Applicants respectfully suggest that the end effector recited in claim 1 is not obvious over *Yokota*.

Ayers does not teach or suggest the elements missing in both *Hosoda* and *Yokota*. In fact, *Ayers* teaches away from being able to “dynamically adjusting the force exerted” on the workpiece. *Ayers*, in several instances, teaches that “a predetermined force is applied to the edge

of the semiconductor slice.” *Ayers*, 2:26-27; 6:18-19. Therefore, Applicants respectfully suggest that the end effector recited in claim 1 is not obvious over *Hosoda* or *Yokota*, in view of *Ayers*..

2. Independent Claim 17 is Patentable Over *Hosoda* and *Yokota*, in view of *Ayers*

Claim 17, among other things, recites:

“a first and second contact arm each operatively mounted to said wafer blade, said first and second contact arms each having a contact pad adapted to contact a peripheral edge of the wafer;

.....

a force sensing device for measuring the amount of force each said contact pad exerts against the peripheral edge of the wafer; and

a force feedback system electrically coupled to said force sensing device and said motor assembly, said force feedback system controlling the operation of said motor assembly based at least in part on the amount of force measured by said force sensing device.”

As discussed above, *Hosoda* does not teach or suggest adjusting the force exerted by the arms 4 and 5 on the wafer after the arms 4 and 5 initially grip the wafer. The gripper arms 4 and 5 disclosed in *Hosoda* exert a fixed force on the wafer. Thus, the end effector disclosed in *Hosoda* does not measure the amount of force the arms 4 and 5 exert on the wafer with a “force sensing device.” And the end effector disclosed in *Hosoda* certainly does not include a “force feedback system” that controls the motion of the arms based in part on the force measured by the “force sensing device.” Thus, Applicants respectfully suggest that claim 17 is not obvious in view of *Hosoda*.

Yokota does not teach or suggest “a force sensing device for measuring the amount of force each said contact pad exerts against the peripheral edge of the wafer.” *Yokota* teaches that “the gripping speed and force at impact may be suitable controlled to reduce impact forces on the substrate.” *Yokota*, 6:27-28. However, *Yokota* teaches controlling the force by “controlling the exhaust of a vacuum actuator through a suitably sized orifice.” *Yokota*, 6:29-30. Venting a vacuum chamber does not measure the amount of force the arms 36 exert on the wafer. It acts

simply as a release valve. Thus, Applicants respectfully suggest that claim 17 is not obvious in view of *Yokota*.

Ayers does not teach or suggest the elements missing in both *Hosoda* and *Yokota*. As discussed above, *Ayers*, in several instances, teaches that “a predetermined force is applied to the edge of the semiconductor slice.” *Ayers*, 2:26-27; 6:18-19. *Ayers* teaches away from an end effector having a “force sensing device” for measuring the amount of force each arm exerts on the wafer. Therefore, Applicants respectfully suggest that claim 17 is not obvious over *Hosoda* or *Yokota*, in view of *Ayers*.

3. Dependent Claims 18 and 20-21 are Patentable Over *Hosoda* and *Yokota*, in view of *Ayers*

Dependent claims 18 and 20-21 depend directly or indirectly from independent claim 17. These dependent claims include all of the limitations of the independent claim from which they depend. Applicants respectfully assert that dependent claims 18 and 20-21 are allowable for at least the reasons set forth above concerning independent claim 17.

B. *Hosoda* or *Yokota*, in view of *Ayers*, and further in view of *Fosssey*

In paragraph 14, the Examiner rejected claims 19 and 28 under 35 U.S.C. 103(a) over *Hosoda* or *Yokota*, in view of *Ayers*, and further in view of *Fosssey*. Applicants cancelled claims 28.

Dependent claim 19 depends directly from independent claim 17. Claim 17, among other things, recites:

“a first and second contact arm each operatively mounted to said wafer blade, said first and second contact arms each having a contact pad adapted to contact a peripheral edge of the wafer;

.....

a force sensing device for measuring the amount of force each said contact pad exerts against the peripheral edge of the wafer; and

a force feedback system electrically coupled to said force sensing device and said motor assembly, said force feedback system controlling the operation of

said motor assembly based at least in part on the amount of force measured by said force sensing device.”

For at least the reasons discussed above regarding claim 17, the apparatus recited in claim 19 is not obvious over *Hosoda* or *Yokota*. Neither *Ayers* nor *Fossey* teach or suggest the elements missing in *Hosoda* and *Yokota*.

As discussed above, *Ayers*, in several instances, teaches that “a predetermined force is applied to the edge of the semiconductor slice.” *Ayers*, 2:26-27; 6:18-19. *Ayers* teaches away from an end effector having a “force sensing device” for measuring the amount of force each arm exerts on the wafer. Therefore, Applicants respectfully suggest that claim 17 is not obvious over *Hosoda* or *Yokota*, in view of *Ayers*. Since claim 19 depends from claim 17, Applicants assert that claim 19 is not obvious over *Hosoda* or *Yokota*, in view of *Ayers*.

Fossey teaches gripping a wafer between a pair of stationary edge grippers 31 and a movable edge gripper 32. A cam mechanism moves the movable edge gripper 32 between a retracted and extended position. *Fossey* does not teach or suggest that the end effector includes a “force sensing device” to measure the amount of force the gripper 32 exerts on the wafer. *Fossey* also does not teach or suggest that the end effector includes a “force feedback system” to control the operation of the cam mechanism. Thus, Applicants respectfully assert that the apparatus recited in claim 17 is not obvious over *Hosoda* or *Yokota*, in view of *Ayers*, and further in view of *Fossey*. Since claim 19 depends from claim 17, claim 19 is also not obvious over *Hosoda* or *Yokota*, in view of *Ayers*, and further in view of *Fossey*.

C. *Yokota* or *Tamai* in view of *Bacchi*

In paragraph 15 of the Office Action, the Examiner rejected claims 4-5 under 103(a) over *Yokota* or *Tamai* in view of *Bacchi*.

1. Dependent Claims 4-5 are Patentable Over *Yokota* or *Tamai* in view of *Bacchi*

Dependent claims 4-5 depend from independent claim 1. Independent claim 1, among other things, recites:

“a first gripper arm and a second gripper arm each operatively mounted to said workpiece blade, said first and second gripper arms each including a contact

pad;

.....

means for dynamically adjusting the force exerted by said first and second gripper arms on the workpiece after said first and second gripper arms are located in said workpiece-engaging position.”

For at least the reasons discussed above regarding claim 1, the end effector recited in claim 1 is not obvious over *Yokota*. Since claims 4-5 depend from claim 1, claims 4-5 are also not obvious over *Yokota*. Neither *Tamai* nor *Bacchi* teach or suggest the elements missing in *Yokota*.

The end effector disclosed in *Tamai* does not include “means for dynamically adjusting the force exerted by said first and second gripper arms on the workpiece after said first and second gripper arms are located in said workpiece-engaging position.” The motion of the arms 152A and 152B are controlled by a cam mechanism that operates as the robotic arms are extended and/or retracted. Thus, Applicants respectfully assert that the end effector recited in claim 1 is not obvious over *Tamai*. Since claims 4-5 depend from claim 1, claims 4-5 are also not obvious over *Tamai*.

The end effector disclosed in *Bacchi* does not include “means for dynamically adjusting the force exerted by said first and second gripper arms on the workpiece after said first and second gripper arms are located in said workpiece-engaging position.” *Bacchi* teaches an active contact point 50 that moves between a retracted and extended position. A vacuum-actuated piston 52 controls the motion of the active contact point 50. The piston 52 includes a vent for releasing vacuum pressure when the pressure exceeds a predetermined limit. The end effector disclosed in *Bacchi* does not include any device for adjusting the amount of force the active contact point 50 exerts on the wafer after the active contact point 50 contacts the wafer. Thus, Applicants respectfully assert that the end effector recited in claim 1 is not obvious over *Yokota* or *Tamai* in view of *Bacchi*. Since claims 4-5 depend from claim 1, claims 4-5 are also not obvious over *Yokota* or *Tamai* in view of *Bacchi*.

ADDITIONAL REMARKS

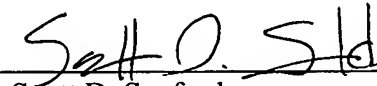
In light of the above, it is respectfully submitted that all of the claims now pending in the subject patent application are allowable, and a Notice of Allowance is requested.

The Commissioner is authorized to charge any underpayment or credit any overpayment to Deposit Account No. 50-3548 for any matter in connection with this response, including any fee for extension of time, which may be required.

Respectfully submitted,

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By: _____


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